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RADIATION PROTECTION FOR NUCLEAR POWER OPERATIONS

Proposed Standards

ENVIRONMENTAL PROTECTION AGENCY

[40 CFR Part 190]

[FRL 376-1]

ENVIRONMENTAL RADIATION PROTECTION FOR NUCLEAR POWER OPERATIONS

Proposed Standards

Reorganization Plan No. 3, which became effective on December 2, 1970, transferred to the Administrator of the Environmental Protection Agency the functions of the former Atomic Energy Commission to establish ". . . generally applicable environmental standards for the protection of the general environment from radioactive material." The Plan defined these standards as "limits on radiation exposures or levels, or concentrations or quantities of radioactive material outside the boundaries of locations under the control of persons possessing or using radioactive material." On May 10, 1974, the Agency published an advance notice of its intent to propose standards under this authority for the uranium fuel cycle and invited public participation in the formulation of this proposed rule.

The Agency has reviewed and considered the comments received in response to that notice and proposes herein environmental radiation standards which would assure protection of the general public from unnecessary radiation exposures and radioactive materials in the general environment resulting from the normal operations of facilities comprising the uranium fuel cycle. Nuclear power generation based on recycled plutonium or on thorium is excluded from these standards because sufficient operating data and experience concerning fuel cycles utilizing these fuels are not yet available. Before any of these developing technologies becomes of potential significance to public health the need for additional generally applicable standards will be considered.

The environmental radiation standards proposed in this notice supplement existing Federal Radiation Protection Guideline limiting maximum exposure of the general public [FR Docs. 60-4539 and 61-9402] by providing more explicit public health and environmental protection from potential effects of radioactive effluents from the uranium fuel cycle during normal operation. Numerically the proposed standards are below current Federal Radiation Protection Guides. The Agency is not, at this time, proposing revisions in existing Federal Radiation Protection Guidance for the general public because of its belief that a detailed examination of each major activity contributing to public radiation exposure is required before revision of this general guidance should be considered. Existing Federal Radiation Protection Guidance for workers in the fuel cycle is also not affected by these proposed standards. In addition, since these standards are proposed under authority derived from the Atomic Energy Act of 1954, as amended, they do not apply to radioactive materials and exposures in the general environment that are the result of effluents from mining operations because that Act does not provide authority over such effluents. Finally, since there are no planned releases from existing radioactive waste disposal sites and these sites primarily serve sources of waste other than uranium fuel cycle operations, these standards do not apply to such sites. The Agency has each of these areas of concern under continuing study.

It is the intent of the Agency to maintain a continuing review of the appropriateness of these environmental radiation standards and to formally review them at least every five years, and to revise them, if necessary, on the basis of information that develops in the interval.

Interagency relationships. Reorganization Plan No. 3 transferred to the Environmental Protection Agency (EPA) the broad guidance responsibilities of the former Federal Radiation Council and also transferred from the former Atomic Energy Commission (AEC) the more explicit responsibility to establish generally applicable radiation standards for the environment. However, the responsibility for the implementation and enforcement of both this guidance and these standards lies, in most cases, in agencies other than EPA as a part of their normal regulatory functions. For nuclear power operations, this responsibility, which had been vested in the AEC, is now vested in the Nuclear Regulatory Commission (NRC), which will exercise the responsibility for implementation of these generally applicable standards through the issuance and enforcement of regulations, regulatory guides, licenses, and other requirements for individual facilities.

Basic considerations. The Agency has concluded that environmental radiation standards for nuclear power industry operations should include consideration of: 1) the total radiation dose to populations, 2) the maximum dose to individuals, 3) the risk of health effects attributable to these doses, including the future risks arising from the release of long-lived radionuclides to the environment, and 4) the effectiveness and costs of the technology available to mitigate these risks through effluent control. The Agency also recognizes the findings of the recent study of the biological effects of low levels of ionizing radiation by the Advisory Committee on the Biological Effects of Ionizing Radiation (BEIR Committee) of the National Academy of Sciences—National Research Council. Two of the principal conclusions of the BEIR Committee were: 1) that current societal needs appear to be achievable "... with far lower average exposure and lower genetic and somatic risk than permitted by the current Radiation Protection Guide. [Thus,] to this extent, the current Guide is unnecessarily high . . ." and 2) that "Guidance for the nuclear power industry should be established on the basis of cost-benefit analysis, particularly taking into account the total biological and environmental risks of the various options available and the cost-effectiveness of reducing these risks."

For the purpose of setting radiation protection standards the most prudent basis for relating radiation dose to its possible impact on public health continues to be to assume that a potential for health effects due to ionizing radiation exists at all levels of exposure and that at the low levels of exposure characteristic of environmental levels of radiation the number of these effects will be directly proportional to the dose of radiation received (a linear non-threshold dose-effect relationship). Even under these assumptions, the range of estimates of the health risks associated with a given level of exposure derived from existing scientific data is broad. It is recognized that sufficient data are not now available to either prove or disprove these assumptions, nor is there any reasonable prospect of demonstrating their validity at the low levels of expected exposure with any high degree of certainty. However, the Agency believes that acceptance of the above prudent assumptions, even with the existence of large uncertainties, provides a sound basis for developing environmental radiation standards which provides reasonable protection of the public health and do so in a manner most meaningful for public understanding of the potential impact of the nuclear power industry. Standards developed on this basis are believed to also protect the overall ecosystem, since there is no evidence that there is any biological species sensitive enough to warrant a greater level of protection than that adequate for man.

Radiological protection of the public from nuclear power industry operations has been based to date on guidance which has had as its primary focus the general limitation of dose to the most exposed individual, rather than limitation of the total population dose from any specific type of activity. The proposed expanded development of the nuclear power industry requires, however, the use of a broader environmental perspective that more specifically considers the potential radiological impact on human populations of radioactive effluents from this industry, rather than just that on the most exposed individual. A number of long-lived radionuclides are now discharged from various fuel cycle operations which carry a potential for buildup of environmental levels and irreversible commitments for exposure of populations that may persist for tens, hundreds, or thousands of years. The extent of the cumulative population doses which may occur over the years following release of such radionuclides is related to their radioactive decay times, the details of their dispersion through environmental media, the period over which they remain in the biosphere, and their exposure (both internal and external) of individuals in populations. The cumulative dose resulting from releases to the environment of such materials can be termed an "environmental dose commit-

ment," and quantitatively expressed in terms of the number of person-rems of dose committed. The proposed standards are based, to the extent that present knowledge permits, on such projections of the migration of radioactive effluents through the biosphere and estimates of the sum of potential doses to present and future populations during that migration.

Since potential effects from radiation exposure are assumed to occur at any level of exposure, it is not possible to specify solely on a health basis an acceptable level of radiation exposure for either individuals or populations; it is necessary to balance the health risks associated with any level of exposure against the costs of achieving that level. In developing the proposed standards, EPA has carefully considered, in addition to potential health effects, the available information on the effectiveness and costs of various means of reducing radioactive effluents, and therefore potential health effects, from fuel cycle operations. This consideration has included the findings of the AEC and the NRC with respect to practicability of effluent controls, as well as EPA's own continuing cognizance of the development, operating experience, and costs of control technology. Such an examination made it possible to propose the standards at levels consistent with the capabilities of control technology and at a cost judged by the Agency to be acceptable to society, as well as reasonable for the risk reduction achieved. Thus, the standards generally represent the lowest radiation levels at which the Agency has determined that the costs of control are justified by the reduction in health risk. The Agency has selected the cost-effectiveness approach as that best designed to strike a balance between the need to reduce health risks to the general population and the need for nuclear power. Such a balance is necessary in part because there is no sure way to guarantee absolute protection of public health from the effects of a nonthreshold pollutant, such as radiation, other than by prohibiting outright any emissions. The Agency believes that such a course would not be in the best interests of society.

The total population impact associated with a particular level of effluent control is best assessed in terms of dose commitments to populations measured in person-rems, which are then converted into estimates of potential health impact. However, the environmental models used for deriving these assessments, while useful for making estimates of potential health impact, are not considered to be so well-defined as to allow standards for populations to be expressed directly in terms requiring their explicit use. The Agency believes that future changes and refinements in models, and thus in the person-rem assessments upon which these standards are based, will occur on a continuing basis. The standards are therefore not proposed directly in terms of person-rems, but future reviews of their adequacy will reflect any changes in model-based assessments of population dose. Standards have also not been proposed directly in terms of person-rems because the regulatory implementation of such a requirement does not appear to be administratively feasible for the fuel cycle under existing widely varying geophysical and demographic conditions and for doses that may, in some instances, be delivered over indeterminately long periods of time. The proposed standards are expressed in terms of 1) limits on individual doses to members of the public and 2) on quantities of certain long-lived radioactive materials in the general environment. On the basis of its assessments of the health risks associated with projected annual population doses and environmental dose commitments, the Agency has concluded that these two types of standards are the most appropriate choice of criteria to provide effective limitation of the potential health impact on populations of short-lived and long-lived radioactive materials, respectively.

Even though adequate protection of populations considered as a whole may be assured by standards based upon the above consideration of health risks and control costs, it may not always be the case that adequate protection is assured on this basis to some individuals in these populations who reside close to the site boundaries of nuclear facilities, because of the distribution characteristics of certain effluents. Such a situation is possible in the case of thyroid doses due to releases of radioiodines from reactors and fuel reprocessing facilities. Although the risk from such doses to nearby individuals is quite small, it is inequitable to permit doses to specific individuals that may be substantially higher than those to other members of the population from other radionuclides. Additional protection for these individuals should be provided when technology or other procedures are available for minimizing any additional potential risk at a reasonable cost. The standards proposed to limit doses to individuals reflect this additional requirement where it is appropriate to do so.

Technical considerations. It is convenient to consider effects of radioactive materials introduced into the environment by the uranium fuel cycle in three categories. Prior to the occurrence of nuclear fission at the reactor only naturally occurring radioactive materials are present in fuel cycle operations. This first category of materials consists principally of uranium, thorium, radium, and radon with its daughter products. Radioactive materials introduced to the environment from facilities for milling, chemical conversion, isotopic enrichment, and fabrication of fuel from uranium which has not been recycled are limited to these naturally occurring radionuclides. As a result of the power-producing fission process at the reactor a large number of new radionuclides are created as fission or activation products. These may be introduced into the general environment principally by reactors or at fuel reprocessing and are conveniently categorized as either long-lived or short-lived fission and activation products, depending upon whether their half-lives are greater than or less than one year. Although naturally occurring radionuclides are of some concern, it is these fission and activation products which are of greatest concern from the point of view of controlling radiation doses to the public due to nuclear power operations.

Standards are proposed for the fuel cycle in two major categories. The proposed standards would limit: 1) the annual dose equivalent to the whole body to 25 millirems, to the thyroid to 75 millirems, and to any other organ to 25 millirems; and 2) the quantities of krypton-85, iodine-129, and certain long-lived transuranic radionuclides released to the environment per gigawatt-year of power produced by the entire fuel cycle to 50,000 curies, 5 millicuries, and 0.5 millicuries, respectively. The first standards are designed to limit population and individual exposures near fuel cycle operations due to short-lived fission-produced materials and naturally occurring materials, and due to transportation of any radioactive materials, while the second specifically addresses potential population exposure and buildup of environmental burdens of long-lived materials.

The proposed standard for annual whole body dose to any individual limits the combined internal and external dose equivalent from gaseous and liquid effluents as well as exposure to gamma and neutron radiation originating from all operations of the fuel cycle to 25 millirems. Such a limit is readily satisfied at all sites for which fuel cycle facilities are presently projected through the year 1985 (including any potential overlap of doses from adjacent sites) by levels of control that are cost-effective for the reduction of potential risk achieved; is in accord with the capabilities of controls anticipated by the AEC for all sites for which Environmental Statements have been filed; and, on the basis of present operating experience at existing sites, can be readily achieved in practice. The combined effect of any combinations of operations at the same location that are foreseeable for the next decade or so was also examined and is judged to be small, so that the proposed standards can readily be satisfied by use of levels of control that are similar to those required for single operations. It should be noted that this proposed standard for maximum whole body dose, which is higher than that proposed by the AEC as guidance for design objectives for light-water-cooled reactors, differs from those objectives in that it applies to the total dose received from the fuel cycle as a whole and from all pathways, including gamma radiation from onsite locations. It is also not a design objective, but a standard which limits doses to the public under conditions of actual normal operation.

The appropriate level for a standard limiting the maximum annual total dose to the thyroid of individuals is not easy

to determine. A standard for maximum total thyroid dose based on considerations limited to the same criteria as for maximum whole body dose (cost-effectiveness of reduction of total population impact and achievability) would permit unacceptably high doses to individuals near some site boundaries. The proposed standard of 75 millirems per year to the thyroid has therefore been chosen to reflect a level of biological risk comparable, to the extent that current capability for risk estimation permits, to that represented by the standard for dose to the whole body. The effluent controls required to achieve this limit have been examined extensively by EPA, AEC, and the industry, particularly in regard to the AEC's proposed Appendix I to 10 CFR 50 for light-water-cooled reactors, and, in the view of the Agency, this level of maximum annual individual dose to the thyroid can be achieved at reasonable effort and cost.

The principal potential doses to internal organs other than the thyroid are to the lung via inhalation of airborne particulates and to bone due to ingestion via water and other pathways of the naturally occurring materials processed in the several components of the fuel cycle required to convert uranium ore into reactor fuel. The impact on populations due to effluents from these operations is generally quite small (due to their predominately remote locations and lack of widespread dispersion), however, significant lung doses are possible to individuals near to these operations, particularly in the case of mills and conversion facilities. The use of well-established, efficient, and inexpensive technology for the retention and control of particulate effluents can readily achieve the levels of control required to meet the proposed standard of 25 millirems per year for limiting dose equivalent to the internal organs (other than thyroid) of individuals.

Environmental radiation exposures from transportation operations are due to direct radiation. Although average radiation doses to individuals in the general public from transportation activities are very small, situations in which individuals could receive higher doses may reasonably be postulated. It is recognized that exposures due to transportation of radioactive materials are difficult to assess and regulate because as shipments move in general commerce between sites the exposed population is constantly changing. Transportation activities should be conducted with every effort made to maintain doses to individuals as low as reasonably achievable, consistent with technical and economic feasibility. In any case, the maximum dose to any member of the general public due to uranium fuel cycle operations, including those due to shipments of radioactive materials, should not exceed the proposed standard of 25 millirems per year to the whole body of an individual. The Agency will continue to examine potential exposures due to transportation of radioactive materials with a view to further action, if necessary.

Among the variety of long-lived radionuclides produced in the fuel cycle, tritium, carbon-14, krypton-85, iodine-129, plutonium, and certain other long-lived transuranic radionuclides are of particular significance as environmental pollutants. Environmental pathways of tritium, carbon-14, and krypton-85 are worldwide. Even though the balance of the above radionuclides may not rapidly become widely dispersed, they are significant because of their potential for extreme persistence in environmental pathways, possibly for thousands of years for plutonium and other transuranics, and for even longer periods for iodine-129.

Because of their high toxicity and long half-lives, the cumulative impact of releases of plutonium and other transuranics to the environment could be large. However, due to very large uncertainties concerning their environmental behavior over long periods of time, as well as a lack of definitive information concerning the relationship between exposure to these materials and health effects, the limits of this potential impact cannot be more than roughly estimated. Therefore prudence dictates that the environmental burden of these materials be minimized to the lowest levels reasonably achievable. Similarly, although its toxicity is less than that of the alpha-emitting transuranics, in view of the extreme persistence of iodine-129 (half-life 17 million years) and great uncertainty concerning its environmental behavior, environmental releases of this isotope should be also maintained at the lowest level reasonably achievable. The prevention of unlimited discharges of krypton-85 to the environment from fuel cycle operations is of high priority because of its potential for significant long-term public health impact over the entire world. Finally, carbon-14 and tritium, both of which rapidly enter worldwide pathways as gaseous radioactive materials, are of particular concern because carbon and hydrogen are principal constituents of the chemical structures of all life forms.

These long-lived radionuclides should only be discharged to the environment after careful consideration of the tradeoffs between the societal benefits of the power generated, the current and projected health risks to populations, and the costs and effectiveness of methods available to limit their release. Since the anticipated maximum dose to any single individual from any of these materials is very small, the primary concern is the cumulative risk to population groups over long periods of time. For this reason, it is not of primary importance where or when in the fuel cycle any such materials are released, since the committed impact will be similar. What is important is to assure that any permitted discharge has been offset by a beneficial product, i.e., a quantity of electricity, and that every reasonable effort has been made to minimize it. It is also important to assure that society is not burdened with unreasonable expenditures to minimize these risks in order to gain the necessary benefits of electric power. Fortunately the vast majority of potential health effects due to release of these radionuclides can be avoided at a reasonable cost. The Agency estimates the cost of implementing the proposed standards for these long-lived radioactive materials to be less than $100,000 per potential case of cancer, leukemia, or serious genetic effect averted (less than $75 per person-rem). In view of the above considerations, the Agency believes that the proposed standards, which limit the number of curies of certain of these radionuclides released to the general environment for each gigawatt-year of electricity produced by the fuel cycle, represent the most reasonable means of providing required protection of the general environment for present and future generations. The standards will assure that any environmental burdens of long-lived radioactive materials accumulate only as the necessary result of the generation of an offsetting quantity of electrical energy.

The proposed standards for long-lived materials fall into two categories: those which can be achieved using currently available methods for control of environmental releases, and those that require use of methods that have been demonstrated on a laboratory or larger scale, but have not yet achieved routine use. In the former case, exemplified by the standard of 0.5 millicuries per gigawatt-year for plutonium and other long-lived alpha-emitting transuranics, the standard limits the environmental burden to the lowest level reasonably achievable using currently available control methods. In the latter case, that of the proposed standard of 50,000 curies per gigawatt-year for krypton-85 and 5 millicuries per gigawatt-year for iodine-129, these limiting levels of environmental burdens are not those achievable by best demonstrated performance, but instead by minimum performance reasonably anticipated from introduction of these new systems into commercial operations. As experience is gained with the ability of the industry to limit fuel cycle releases of these materials to the environment, it may be appropriate to reconsider the standards limiting the maximum environmental burdens of these particular radionuclides.

Similarly, as knowledge becomes available concerning the practicability of limiting environmental releases of tritium and carbon-14, the appropriate levels of maximum environmental burdens of these radionuclides due to fuel cycle operations will be carefully considered by the Agency. However, the knowledge base now available is inadequate for such a determination, and no standards are presently proposed for these radionuclides. The potential for a long-term impact due to carbon-14 released from fuel cycle operations was not recognized until the Agency considered environmental dose commitments from the industry in the course of developing these standards; thus consideration of methods for limit-

ing its release to the general environment are only now beginning. Tritium levels in the general environment from fuel cycle operations are not expected to become significant until the late 1980's, and development programs are in existence for control of releases of this radionuclide from its principal source, fuel reprocessing operations. The Agency believes that the development and installation of controls to minimize environmental burdens of both carbon-14 and tritium are important objectives, and will carefully follow the development of new knowledge concerning both the impact and controllability of these radionuclides.

To allow adequate time for implementing the standards for krypton-85 and iodine-129 control, including the necessary testing and analysis required prior to licensing of these control systems, the effective date is proposed as January 1, 1983. Implementation by this date would result in control of these releases before any substantial potential health impact from these materials due to uranium fuel cycle operations can occur and would, in the judgment of the Agency, provide adequate protection of public health thereafter.

The proposed standard for maximum dose to organs excludes radon and its daughter products. Radon is released as a short-lived (3.8 days half-life) inert gas, mainly from tailings piles at mills, and produces its principal potential impact through deposition of its daughter products in the lung. There exists considerable uncertainty about the public health impact of existing levels of radon in the atmosphere, as well as over the best method for management of new sources of radon created by man's activities, which remove this naturally occurring material and its precursors from beneath the earth's protective crust. Radon levels in the general environment are substantial and are dominated by natural sources, except in the immediate vicinity of man-made sources. Exposures from radon and its daughters have previously been the subject of Federal Radiation Protection Guidance, in the case of underground uranium miners (FR Doc. 71-7210 and FR Doc. 71-9697), and of guidance from the Surgeon General, in the case of public exposure due to the use of uranium mill tailings in or under structures occupied by members of the general public ("Use of Uranium Mill Tailings for Construction Purposes," Hearings before the Subcommittee on Raw Materials of the Joint Committee on Atomic Energy, October 28-29, 1971, pp. 226-233). The Agency has concluded that the problems associated with radon emissions are sufficiently different from those of other radioactive materials associated with the fuel cycle to warrant separate consideration, and has underway an independent assessment of man-made sources of radon emissions and their management.

Implementation of the standards. These proposed standards are expected to be implemented for the various components of the uranium fuel cycle, operating under normal conditions, by the Nuclear Regulatory Commission. The mechanisms by which these standards are achieved will be a matter between the NRC and the industries that are licensed to carry out various uranium fuel cycle operations, but, in general, will be based on regulations and guides for the design and operation of the various facilities. The Agency is confident that these proposed standards can be effectively implemented by such procedures.

Current rules and regulations applicable to fuel cycle operations generally contain provisions which have the effect of limiting doses to individuals, thus implementation of the proposed standards for maximum doses to individuals should be straightforward. Protection of the public from the environmental accumulation of long-lived radioactive materials may require some changes in regulatory requirements. For example, this standard limit environmental accumulations of certain radionuclides associated with the generation of a gigawatt-year of electrical energy, which is generated only at the power reactor. Since other operations in the cycle which do not generate power are more likely to discharge such materials, it may be necessary for the regulatory agency to make an appropriate allocation to each facility and to determine the emission rates required to satisfy the standard for the entire fuel cycle. This is especially the case for a radionuclide like krypton-85 which can be released either at reactors, during fuel storage, or during fuel reprocessing. The standards do not specify the time, location, or concentration of emissions of long-lived radionuclides. Once a given quantity of electrical power has been generated the specified amount of the radionuclide may be released at any time and at any rate or location that does not exceed the individual dose limitations. Demonstration of compliance with the standard requires only that the total quantity of electricity generated after the effective date of the standards be recorded to determine the maximum quantity of these long-lived radionuclides that may eventually be released.

The Agency recognizes that implementation of the standards for krypton-85 and iodine-129 by the proposed effective date of January 1, 1983, will require successful demonstration of control technology for commercial use that is now in advanced stages of development. The Agency, as stated above, intends to review all of these standards in at least five year intervals. If substantial difficulty should develop for implementing the standards for krypton-85 and iodine-129 with respect to the proposed levels, facility safety, or cost, the Agency will give these factors careful and appropriate consideration prior to the effective date.

With respect to operations associated with the supply of electrical power it is important not only to set standards which will provide satisfactory public health protection, consistent with technical and economic feasibility, but also to minimize societal impacts which may occur as the result of temporary interruptions in those fuel cycle operations that are necessary to assure the orderly delivery of electric power. Such a two-fold objective requires consideration of the question whether to impose stricter standards which achieve lower levels of radiation exposure and environmental burdens of long-lived radioactive materials, but which may force temporary shutdowns which may not be justified on a risk-benefit basis for such periods; or to establish more liberal standards which decrease the possibility of such shutdowns, but may be overly permissive with respect to public exposure and long-term environmental releases. The Agency has attempted to avoid this dilemma by proposing standards that are not permissive with respect to either public exposures or long-term environmental releases and at the same time providing a variance which allows the standards to be temporarily exceeded under unusual conditions. The use of such variances by the regulatory agency will depend to a large degree upon their value judgments concerning the necessity of the fuel cycle operation concerned to a region, overall facility safety, and the possible impact on public health. The proposed variance provides that temporary increases above the standards for normal operations are allowable when the public interest is served, such as to maintain a dependable source of continuous power or during a power crisis. The Agency anticipates that the need to use such variances will be infrequent and of short duration, and that the overall impact on population and individual radiation doses from the operations of the entire fuel cycle will be minimal.

With respect to regulatory implementation of the flexibility provided by this proposed variance provision, the Agency has carefully examined the guidance for design objectives and limiting conditions for operation of light-water-cooled nuclear power reactors as set forth recently by the NRC in Appendix I to 10 CFR 50. It is the view of the Agency that this guidance for reactors will provide an appropriate and satisfactory implementation of these proposed environmental radiation standards for the uranium fuel cycle with respect to light-water-cooled nuclear reactors utilizing uranium fuel. The various monitoring and reporting procedures required by the AEC in the past and supplemented by Appendix I are expected to provide continuing information sufficient to determine that these standards are being satisfied during the course of normal operations of the fuel cycle.

Although the Agency has attempted to limit the effect of radioactive discharges from the fuel cycle on populations and on individuals through these proposed standards, it has not attempted to specify constraints on the selection of sites for fuel cycle facilities, even though the Agency recognizes that siting is an important factor which affects the potential health impact of most planned releases from operations in the fuel cycle. The standards were developed, however, on the assumption that sound siting practices will continue to be promoted

as in the past and that facility planners will utilize remote sites with low population densities to the maximum extent feasible.

The Agency has also considered the need for special provisions for single sites containing large numbers of facilities, of single or mixed types, as exemplified by the "nuclear park" concept. Present construction projections by utilities indicate that no such sites are likely to be operational during the next ten years. In view of the need to accumulate operating experience for the new large individual facilities now under construction and the intent of the Agency to review these standards at reasonable intervals in the future, it is considered premature and unnecessary to predicate these standards on any siting configurations postulated for the next decade and beyond. The Agency will consider changes in these standards based on such considerations when they are needed and justified by experience.

It is the conclusion of the Agency that implementation of the proposed standards for normal operations of the nuclear power industry based on the uranium fuel cycle will provide society protection of its environment and the health of its citizens and that this protection is obtained without placing unreasonable financial burdens upon society. In this context, these standards are responsive to the President's energy messages of June 4, 1971, and April 18, 1973, which challenged the Nation to the twin objectives of developing sufficient new energy resources while providing adequate protection for public health and the environment.

Request for comments. Notice is hereby given that pursuant to the Atomic Energy Act of 1954, as amended, and Reorganization Plan No. 3 of 1970 (FR Doc. 70-13374), adoption of Part 190 of Title 40 of the Code of Federal Regulations is proposed as set forth below. All interested persons who wish to submit comments or suggestions in connection with this proposed rulemaking are invited to send them to the Director, Criteria and Standards Division (AW-560), Office of Radiation Programs, Environmental Protection Agency, Washington, D.C. 20460, on or before July 28, 1975. Within this same time period, interested parties are also invited to indicate their desire to participate in a public hearing on the proposed rulemaking to be scheduled after the comment period ends. Comments and suggestions received after July 28, 1975 period will be considered if it is practical to do so, but such assurance can only be given for comments filed within the period specified. Single copies of a Draft Environmental Statement for the proposed standards and a technical report entitled "Environmental Analysis of the Uranium Fuel Cycle" are available upon request at the above address. The above-mentioned technical documents and comments received in response to this notice, as well as comments received in response to the Agency's advance notice of this proposed rulemaking published on May 10, 1974, and the Agency's response to these comments, constitute part of the background for this rulemaking and may be examined in the Agency's Freedom of Information Office, 401 M Street, SW., Washington, D.C. 20460.

Dated: May 23, 1975.

RUSSELL E. TRAIN,
Administrator.

A new Part 190 is proposed to be added to Title 40, Code of Federal Regulations, as follows:

PART 190—ENVIRONMENTAL RADIATION PROTECTION STANDARDS FOR NUCLEAR POWER OPERATIONS

Subpart A—General Provisions

Sec.
190.01 Applicability.
190.02 Definitions.

Subpart B—Environmental Standards for the Uranium Fuel Cycle

190.10 Standards for normal operations.
190.11 Variance for unusual operations.
190.12 Effective date.

AUTHORITY: Atomic Energy Act of 1954, as amended; and Reorganization Plan No. 3 of 1970.

Subpart A—General Provisions

§ 190.01 Applicability.

The provisions of this part apply to radiation doses received by members of the public in the general environment and to radioactive materials introduced into the general environment as the result of operations which are part of a nuclear fuel cycle.

§ 190.02 Definitions.

(a) "Nuclear fuel cycle" means the operations defined to be associated with the production of electrical power for public use by any fuel cycle through utilization of nuclear energy.

(b) "Uranium fuel cycle" means all facilities conducting the operations of milling of uranium ore, chemical conversion of uranium, isotopic enrichment of uranium, fabrication of uranium fuel, generation of electricity by a light-water-cooled nuclear power plant using uranium fuel, reprocessing of spent uranium fuel, and transportation of any radioactive material in support of these operations, to the extent that these support commercial electrical power production utilizing nuclear energy, but excludes mining operations and the reuse of recovered non-uranium fissile products of the cycle.

(c) "General environment" means the total terrestrial, atmospheric and aquatic environments outside sites upon which any operation which is part of a nuclear fuel cycle is conducted.

(d) "Site" means any location, contained within a boundary across which ingress or egress of members of the general public is controlled by the person conducting activities therein, on which is conducted one or more operations covered by this part.

(e) "Radiation" means any or all of the following: alpha, beta, gamma, or x rays; neutrons; and high-energy electrons, protons, or other atomic particles; but not sound or radio waves, nor visible, infrared, or ultraviolet light.

(f) "Radioactive material" means any material which emits radiation.

(g) "Uranium ore" is any ore which contains one-twentieth of one percent (0.05 percent) or more of uranium by weight.

(h) "Curie" (Ci) means that quantity of radioactive material producing 37 billion nuclear transformations per second. (One millicurie (mCi)=0.001 Ci.)

(i) "Dose equivalent" means the product of absorbed dose and appropriate factors to account for differences in biological effectiveness due to the quality of radiation and its spatial distribution in the body. The unit of dose equivalent is the "rem." (One millirem (mrem) =0.001 rem.)

(j) "Organ" means any human organ exclusive of the dermis, the epidermis, or the cornea.

(k) "Gigawatt-year" refers to the quantity of electrical energy produced at the busbar of a generating station. A gigawatt is equal to one billion watts. A gigawatt-year is equivalent to the amount of energy output represented by an average electric power level of one gigawatt sustained for one year.

(l) "Member of the public" means any individual that can receive a radiation dose in the general environment, whether he may or may not also be exposed to radiation in an occupation associated with a nuclear fuel cycle. However, an individual is not considered a member of the public during any period in which he is engaged in carrying out any operation which is part of a nuclear fuel cycle.

(m) "Regulatory agency" means the government agency responsible for issuing regulations governing the use of sources of radiation or radioactive materials or emissions therefrom and carrying out inspection and enforcement activities to assure compliance with such regulations.

Subpart B—Environmental Standards for the Uranium Fuel Cycle

§ 190.10 Standards for normal operations.

(a) The annual dose equivalent shall not exceed 25 millirems to the whole body, 75 millirems to the thyroid, and 25 millirems to any other organ of any member of the public as the result of exposure to planned discharges of radioactive materials, radon and its daughters excepted, to the general environment from uranium fuel cycle operations and radiation from these operations.

(b) The total quantity of radioactive materials entering the general environment from the entire uranium fuel cycle, per gigawatt-year of electrical energy produced by the fuel cycle, shall contain less than 50,000 curies of krypton-85, 5

millicuries of iodine-129, and 0.5 millicuries combined of plutonium-239 and other alpha-emitting transuranic radionuclides with half-lifes greater than one year.

§ 190.11 Variance for unusual operations.

The standards specified in § 190.10 may be exceeded if:

(a) The regulatory agency has granted a variance based upon its determination that a temporary and unusual operating condition exists and continued operation is necessary to protect the overall societal interest with respect to the orderly delivery of electrical power, and

(b) Information delineating the nature and basis of the variance is made a matter of public record.

§ 190.12 Effective date.

(a) The standards in this Subpart, excepting those for krypton-85 and iodine-129, shall be effective 24 months from the promulgation date of this rule.

(b) The standards for krypton-85 and iodine-129 shall be effective January 1, 1983.

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(Revised as of January 1, 1975)

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